the northward, and on the 13th the barometer fell to 29.47 (748) at Leith, Scotland. During the 15th a storm passed northeastward from the lower Saint Lawrence valley, and on the 16th was apparently central off the Labrador coast. The weather continued unsettled over and near Newfoundland during the 17th, and by the 18th there was a marked decrease in pressure, unsettled weather, and fresh gales over the Canadian Maritime Provinces. On the evening of the 19th a storm of slight energy was central on the New England coast, whence it moved to the southeast of Nova Scotia by the 20th, attended by fresh gales, after which it apparently dissipated. On the 18th unsettled weather prevailed over and near the British Isles. On the 26th and 27th a storm was central northwest of the British Isles, and on the latter-named date pressure falling to or below 29.40 (747) was reported in that region. By the 28th this storm had advanced to north of the British Isles. On the 27th a storm was central north of the Gulf of Saint Lawrence, having advanced from the Saint Lawrence Valley. Moving east-northeast the storm reached the 30th meridian by the 29th, attended by fresh to strong gales and pressure falling to about 29.40 (747), and during the 30th and 31st it apparently remained central south or southwest of Iceland, with decreasing pressure, and fresh gales in the trans-Atlantic steamship routes. On the 31st a storm central in the lower Saint Lawrence valley was attended by fresh gales south of Nova Scotia.

OCEAN ICE IN JULY.

The following table shows the southern and eastern limits of the region within which icebergs or field ice were reported for July, during the last eight years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Long. W.	Month.	Lat. N.	Long. W.
	° ′	° ′		° ′	° ′
July, 1883	42 42	49 57	July, 1883	46 47	45 44
July, 1884	46 24	50 02	July, 1884	48 36	46 28
July, 1885	42 14	48 30	July, 1885	48 00	44 00
July, 1886	42 59	49 18	July, 1886†	45 52	34 39
July, 1887	43 30	50 05	July, 1887	52 04	41 16
July, 1888*	.....	.....	July, 1888	47 40	50 10
July, 1889	44 49	47 45	July, 1889	45 50	40 00
July, 1890	41 25	47 30	July, 1890‡	50 08	38 45

*Off Cape Race. †An iceberg and field ice. ‡On the 10th a small piece of ice was reported in N. 48° 33′, W. 24° 11′.

The above table shows that for July, 1890, ice was reported about 2½° farther south, and over 4° farther east than the average southern and eastern limits of Arctic ice for the month, as determined from reports of the last seven years. The southernmost ice reported for the current month, a large iceberg on the 15th in the position given, was nearly 1° farther south than the southernmost ice previously reported for July, no ice having been noted south of the 42d parallel for the corresponding month of preceding years, and the easternmost ice reported, a small iceberg on the 6th in the position given, was about 4° west of the extreme eastern limit of ice for July, and was the only ice reported east of the 40th meridian, save in 1886, when an iceberg was noted in W. 34° 30′. Comparing the current with the preceding month, there was a marked decrease in the aggregate quantity of ice reported over and near the Banks of Newfoundland, and an increase along the east coast of Newfoundland. Numerous icebergs and heavy field ice were reported in, and east of, the Straits of Belle Isle, along the Labrador coast, and in the Gulf of Saint Lawrence east of the 60th meridian. Compared with the corresponding month of preceding years the ice reported for July, 1890, about equalled the average in quantity. The limits of the region within which Arctic ice was reported for July, 1890, are shown on chart i by ruled shading.

FOG IN JULY.

The limits of fog-belts west of the 40th meridian, as determined from reports of shipmasters, are shown on chart i by dotted shading. In the vicinity of the Banks of Newfoundland fog was reported on 26 dates; between the 55th and 65th meridians on 14 dates; and west of the 65th meridian on 10 dates. Compared with the corresponding month of the last two years the dates of occurrence of fog near the Grand Banks numbered 3 more than the average; between the 55th and 65th meridians 2 less than the average; and west of the 65th meridian 2 more than the average. The 15th, 21st, and 29th to 31st were the only dates on which fog was not reported over or near the Grand Banks. On all dates on which fog was reported near the Banks of Newfoundland there were storms approaching from the west, save on the 13th when it occurred with unsettled weather, rain, and high pressure, and from the 22d to 25th when it was noted while high pressure prevailed over that region. Between the 55th and 65th meridians fog was reported with the approach or passage to the northward of general storms, save on the 12th, 13th, and 30th when it occurred while relatively high pressure, unsettled weather, and rain prevailed in that region. West of the 65th meridian fog was reported with the approach or passage to the northward of general storms, save on the 28th and 30th, when it occurred while high pressure and unsettled weather prevailed in that region. On the 1st to 5th, 14th, 15th, 17th, 24th, 25th, and 29th dense fog was reported at points along the New England or New York coasts by observers of the Signal Service, its occurrence in each instance attending the presence in the Saint Lawrence Valley or the Lake region of general storms whose influence extended off the coast.

TEMPERATURE OF THE AIR (expressed in degrees, Fahrenheit).

Many of the voluntary stations do not have standard thermometers or shelters.

The distribution of mean temperature over the United States and Canada for July, 1890, is exhibited on chart ii by dotted isotherms. In the table of miscellaneous meteorological data the monthly mean temperature and the departure from the normal are given for regular stations of the Signal Service. The figures opposite the names of the geographical districts in the columns for mean temperature and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the departure is below the normal and subtracting when above. The monthly mean temperature for regular stations of the Signal Service represents the mean of the maximum and minimum temperatures.

The mean temperature was highest in the valley of the Colorado River from extreme south Nevada southward, and in the adjoining part of Cal., and in the middle and lower Gila valleys, where it was above 95. The mean values were above 85 in southeast Cal. south of the San Joaquin Valley, in southern Nev., west and southwest Ariz., in the lower Rio Grande valley, from central Tex. northward to south-central Kansas, and from northwest Kans. over extreme southwest Nebr. and a part of northeast Colo. The mean temperature was lowest in west-central Colo., where it was below 55; at Tatoosh Island, Wash., the mean temperature was 49.8. The mean values were below 60 in the lower Saint Lawrence valley, and along the immediate Pacific coast from San Francisco, Cal., northward, and were below 65 north of a line traced from the coast of eastern Me. irregularly westward to northeast Minn., in the British Possessions north of N. Dak., western Mont., and Wash., and along the immediate Pacific coast north of the 35th parallel.

The mean temperature was generally above the normal from the Mississippi River and the upper lake region westward to the western part of the middle and northern plateau regions,

on the south Pacific coast, and in the Canadian Maritime Provinces; elsewhere the month was cooler than the average July. The greatest departures above the normal temperature were reported in Kans., Nebr., on the northeastern slope of the Rocky Mountains, and in the lower valley of the Red River of the North, where they exceeded 3, and the most marked departures below the normal temperature were noted along the Atlantic coast south of the 40th parallel, and in northwest Oregon, where they exceeded 2.

At stations in the Missouri Valley and on the eastern slope of the Rocky Mountains the mean temperature was the highest; and at stations along the Atlantic coast south of Massachusetts, and on the west Gulf and north Pacific coasts the mean temperature was the lowest reported for July.

DEVIATIONS FROM NORMAL TEMPERATURE.

The following table shows for certain stations, as reported by voluntary observers, (1) the normal temperature for July for a series of years; (2) the length of record during which the observations have been taken, and from which the normal has been computed; (3) the mean temperature for July, 1890; (4) the departure of the current month from the normal; (5) and the extreme monthly mean for July, during the period of observation and the years of occurrence:

Deviations from normal temperature—Continued.

State and station.	County.	(1) Normal for the month of July.	(2) Length of record.	(3) Mean for July, 1890.	(4) Departure from normal.	(5) Extreme monthly mean for July.			
						Highest.	Year.	Lowest.	Year.
Arkansas.		°	Years	°	°	°		°	
Lead Hill	Boone	81.6	8	82.4	+ 0.8	84.2	1888	75.2	1882
California.									
Sacramento	Sacramento	73.0	37	68.4	— 4.6	80.6	1854	68.3	1889
Connecticut.									
Middletown	Middlesex	71.0	22	69.0	— 2.0	75.4	1886	66.9	1860
Florida.									
Merritt's Island	Brevard	80.4	8	81.3	+ 0.9	82.3	1882	78.5	1886
Georgia.									
Forsyth	Monroe	82.2	16	80.2	— 2.0	85.7	1881	78.3	1882
Illinois.									
Peoria	Peoria	78.3	34	79.2	+ 0.9	83.2	1887	71.2	1885
Riley	McHenry	71.5	34	70.8	— 0.7	80.2	1868	65.5	1882
Indiana.									
Vevay	Switzerland	77.7	24	76.0	— 1.7	84.3	1868	73.0	1869
Iowa.									
Cresco	Howard	71.2	17	70.8	— 0.4	75.2	1874	65.4	1882
Monticello	Jones	73.0	36	73.9	+ 0.9	79.3	1868	63.2	1863
Logan	Harrison	75.5	16	77.0	+ 1.5	79.5	1881	69.8	1882
Kansas.									
Lawrence	Douglas	78.3	28	80.6	+ 2.3	85.1	1868	72.0	1882
Wellington	Sumner	78.3	11	83.1	+ 4.8	83.9	1879	73.0	1882
Louisiana.									
Grand Coteau*	Saint Landry	82.7	6	.....	.....	.....	.....	.....	.....
Maine.									
Orono	Penobscot	67.0	20	66.2	— 0.8	71.0	1887	64.2	1884
Maryland.									
Cumberland	Allegany	72.1	30	73.9	+ 1.8	77.7	1887	67.4	1860
Massachusetts.									
Amherst	Hampshire	70.8	54	70.0	— 0.8	76.1	1887	66.4	1860
Newburyport	Essex	69.1	12	69.2	+ 0.1	71.1	1882	67.5	1884
Somerset	Bristol	74.1	18	73.1	— 1.0	77.9	1876	71.4	1884, '88
Michigan.									
Kalamazoo	Kalamazoo	72.6	13	72.3	— 0.3	77.8	1885	67.5	1884
Thornville	Lapeer	71.8	13	72.2	+ 0.4	76.2	1887	68.8	1884
Minnesota.									
Minneapolis	Hennepin	71.2	25	71.0	— 0.2	77.2	1866	65.8	1882
Montana.									
Fort Shaw	Lewis & Clarke	68.4	21	70.0	+ 1.6	74.1	1886	61.5	1884
New Hampshire.									
Hanover	Grafton	69.4	47	67.5	— 1.9	72.4	1870	62.3	1844
New Jersey.									
Moorestown	Burlington	75.2	27	72.4	— 2.8	78.8	1863	70.6	1888
South Orange	Essex	73.2	19	70.1	— 3.1	77.8	1876	69.3	1884
New York.									
Cooperstown	Otsego	68.5	36	65.4	— 3.1	73.4	1854, '70	62.7	1860
Palermo	Oswego	69.6	36	67.6	— 2.0	76.6	1864	62.3	1860
North Carolina.									
Lenoir	Caldwell	74.8	17	73.0	— 1.8	77.7	1877	66.4	1884
Ohio.									
N'th Lewisburgh	Champaign	73.4	58	77.4	+ 4.0	81.0	1887	68.0	1835, '47
Wauseon	Fulton	72.7	20	72.8	+ 0.1	77.1	1887	67.7	1882
Oregon.									
Albany	Linn	66.3	12	65.6	— 0.7	69.9	1889	63.2	1881
Eola	Polk	64.7	20	62.0	— 2.7	70.3	1889	59.6	1888
Pennsylvania.									
Dyberry	Wayne	68.3	22	64.8	— 3.5	72.6	1887	63.2	1865
Grampian Hills	Clearfield	70.7	26	70.2	— 0.5	76.8	1887	66.6	1884
Wellsborough	Tioga	70.5	11	65.5	— 5.0	76.1	1881	65.5	1890
South Carolina.									
Statesburgh	Sumter	79.0	9	75.9	— 3.1	84.0	1881	75.9	1890
Tennessee.									
Austin	Wilson	79.5	22	81.4	+ 1.9	85.2	1879	71.6	1885
Texas.									
New Ulm	Austin	82.6	18	84.1	+ 1.5	85.0	1879	80.6	1880
Vermont.									
Strafford	Orange	69.5	17	68.4	— 1.1	73.5	1887	67.0	1881
Virginia.									
Birdsnest	Northampt'n	78.9	22	77.4	— 1.5	84.0	1887	74.3	1871
Washington.									
Fort Townsend	Jefferson	61.8	16	59.9	— 1.9	66.1	1875	58.7	1879
Wisconsin.									
Madison	Dane	72.0	21	71.7	— 0.3	75.8	1859	67.7	1884

* Not received.

MAXIMUM AND MINIMUM TEMPERATURES.

The highest temperature reported by a regular station of the Signal Service was 115, at Yuma, Ariz., on the 22d. The maximum temperature rose to or above 110 in the Sacramento and San Joaquin valleys, Cal., and in the Colorado Valley from south Nevada southward, and was above 100 over the west and south parts of the southern plateau region, the south part of the middle plateau, in eastern Oregon and Washington, along the eastern slope of the Rocky Mountains, and in the Missouri, middle Mississippi, and Rio Grande valleys. The lowest maximum temperature occurred along the immediate Pacific coast north of San Francisco, Cal., where it was below 70. On the southeast and extreme east coasts of New England the maximum temperature was below 85. The reports of United States Army post surgeons and state weather service and voluntary observers show the following maximum temperatures in states and territories where temperature rising to or above 100 was reported: Volcano Springs, Cal., 126; Fort Mojave, Ariz., and Gove City, Kans., 120; El Dorado Canyon, Nev., 118; River Bend, Colo., Thedford and Wilcox, Nebr., and Saint George, Utah, 112; Camp del Rio, Tex., 111; Tipton, Pa., Pickering, Mo., and Glenwood, Iowa, 110; Fort Fetterman, Wyo., Steele, N. Dak., and Coalgate, Ind. T., 108; Fort Selden, N. Mex., and Fort Bennett, S. Dak., 107; Fort Walla Walla and North Yakima, Wash., Lead Hill, Ark., several stations in Illinois, and Columbus (2), Miss., 106; Opelika, Ala., Fort Keogh and Glendive, Mont., 105; Eastman, Ga., Brewer Mine, S. C., and Dyersburgh, Tenn., 104; Angola, Ind., West Milton, Ohio, and Richmond, Va., 103; several stations in Louisiana, 102; Murray, Ky., Woodbury, N. J., Summit Lake, Wis., and Heppner, Oregon, 101; Cumberland (2), Md., Lawrence, Mass., Bangor, Me., Crookston, Minn., and several stations in New York, 100.

At the following named stations of the Signal Service the maximum temperature for the current month was as high or higher than previously reported for July: Albany, N. Y., 17 years record, 98, 1 above 1886; Vicksburg, Miss., 19 years record, 99, the same as 2 or more years; New Orleans, La., 20 years record, 96, the same as 1888; Erie, Pa., 18 years record, 94, the same as 1878; Cleveland, Ohio, 20 years record, 97, 1 above 1878; Sandusky, Ohio, 12 years record, 98, the same as 1887; Moorhead, Minn., 10 years record, 98, 2 above 1887; Saint Vincent, Minn., 10 years record, 95, the same as 1886; Keokuk, Iowa, 20 years record, 104, 4 above 1887; Omaha, Nebr., 20 years record, 105, the same as 1874; Concordia, Kans., 6 years record, 103, the same as 1888; Spokane Falls, Wash., 10 years record, 102, 2 above 1886; Walla Walla, Wash., 5 years record, 106, 2 above 1886.

Among extremely high temperatures reported at regular stations of the Signal Service for July of preceding years are: 117 in 1889 and 118 in 1878, at Yuma, Ariz.; 115 at Fort Bayard, N. Mex., in 1882; 111 at Fort Benton, Mont., in 1886; and 109 at Fort Gibson, Ind. T., in 1879. Among high temperatures reported for July by United States Army post surgeons and voluntary observers are: 128 at Mammoth Tank, Cal., 1887; 126 at Volcano Springs, Cal., in 1889; 122 at

Humboldt, Cal., in 1887; 120 at Fort Mojave, Ariz., in 1889; 119 at Fort Miller, Cal., in 1853, and at El Dorado Canyon, Nev., in 1889; 115 at Saint George, Utah, in 1889; and 114 at Gibson, Kans., in 1889.

The lowest temperatures reported by regular stations of the Signal Service were: 36 at Tatoosh Island, Wash., 20th; 37 at Baker City Oregon, 10th, and at Fort Washakie, Wyo., 11th; and 38 at Northfield, Vt., 21st. The minimum temperature was below 50 north of a line traced from the Maine coast southwestward to south-central Pa., thence northward to western N. Y., thence irregularly westward to eastern Wyo., thence southward to central N. Mex., thence northwestward to northern Utah, thence south of west to east-central Cal., thence northward to northern Cal., and thence southward, inside the coast line, to San Francisco, Cal. The minimum temperature was highest, 74, at Yuma, Ariz., and was 70, or above, at Jupiter, Fla., Galveston, Corpus Christi, and Rio Grande City, Tex. The reports of United States Army post surgeons and state weather service and voluntary observers show the following minimum temperatures in states and territories where temperature falling below 40 was reported: Breckenridge, Colo., 26; Soda Springs, Idaho, 27; Elko (2), Nev., 28; Berlin Mills, N. H., Bangor, Me., and Virginia City, Mont., 30; Happy Valley and Beulah, Oregon, 31; Huntingdon, Pa., and Boca, Cal., 33; Number Four, N. Y., 34; Waterville, Wash., and Coolidge, N. Mex., 35; Aberdeen, S. Dak., 36; Orangeville, Ohio, Lake Cochituate, Mass., and Fort Bridger, Wyo., 37; Oceanic, N. J., Christiansburgh, Va., and several stations in N. Dak., 38; and Greenwood, Wis., 39.

At the following named stations of the Signal Service the minimum temperature for the current month was as low or lower than previously reported for July: New Haven, Conn., 18 years record, 49, 1 below minimum of 1885; Albany, N. Y., 17 years record, 48, the same as 1876; Philadelphia, Pa., 20 years record, 54, 2 below 1883; Atlantic City, N. J., 17 years record, 52, 1 below 1880; Baltimore, Md., 20 years record, 55, 1 below 1885; Washington City, 20 years record, 53, 1 below 1885; Lynchburgh, Va., 20 years record, 54, the same as 1885; Southport, N. C., 15 years record, 58, 2 below 1885; Wilmington, N. C., 20 years record, 58, 2 below 1888; Jacksonville, Fla., 19 years record, 66, 2 below 2 or more years; New Orleans, La., 20 years record, 68, 2 below 1882; Fort Smith, Ark., 9 years record, 58, 2 below 1889; Columbus, Ohio, 13 years record, 50, 1 below 1885; Rochester, N. Y., 19 years record, 47, the same as 1886; and Cleveland, Ohio, 20 years record, 50, 2 below 2 or more years.

RANGES OF TEMPERATURE.

The greatest and least daily ranges of temperature at regular stations of the Signal Service are given in the table of miscellaneous meteorological data. The greatest monthly ranges of temperature occurred in the northern plateau region, where they exceeded 60, whence they decreased westward to less than 20 on the immediate Pacific coast, southward to less than 40 over the southeast part of the plateau region, southeastward to less than 30 on the Gulf and south Atlantic coasts, and eastward to less than 40 over the southern part of the upper lake region; from the Lake region the monthly ranges increased to more than 50 in northwest New England, whence they decreased to less than 30 on the southeast coast of New England.

FROST.

On the 20th light frost was reported in Litchfield Co., Conn., which caused some damage to tender plants in low ground. On the 21st light frost occurred in Onondaga and Delaware counties, N. Y., and in Baltimore Co., Md. On the 20th and 21st light frost occurred generally in northern Ohio, and on the 21st heavy frost was reported at Youngstown, Ohio, and a few miles north of that place considerable damage was caused to corn and potatoes. On the 22d light frost was noted at Oakland, Md. No frost was reported in the central valleys. In the plateau region light frost occurred near Great Salt Lake, Utah, on the 10th and 11th, and at Carson City, Nev., on the 11th, 30th, and 31st. Light frost was noted in southwest Montana on the 31st. On the Pacific coast light frost was reported in northwest Oregon on the 10th.

TEMPERATURE OF WATER.

The following table shows the maximum, minimum, and mean water temperature as observed at the harbors of the several stations; the monthly range of water temperature; and the mean temperature of the air for July, 1890:

Stations.	Temperature at bottom.				Mean temperature of air at the station.
	Max.	Min.	Range.	Monthly mean.	
	°	°	°	°	°
Boston, Mass	69.0	61.7	7.3	65.5	71.0
Canby, Fort, Wash	64.9	62.4	2.5	63.9	57.8
Charleston, S. C	87.5	80.0	7.5	83.8	79.8
Eastport, Me	52.0	46.8	5.2	49.3	60.8
Galveston, Tex	88.0	83.5	4.5	85.7	82.7
Key West, Fla	88.8	84.0	4.8	87.0	82.2
Portland, Oregon	71.0	64.5	6.5	68.0	65.5

PRECIPITATION (expressed in inches and hundredths).

The distribution of precipitation over the United States and Canada for July, 1890, as determined from the reports of nearly 2,000 stations, is exhibited on chart iii. In the table of miscellaneous meteorological data the total precipitation and the departure from the normal are given for each Signal Service station. The figures opposite the names of the geographical districts in the columns for precipitation and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the precipitation is below the normal and subtracting when above.

The heaviest precipitation reported was 19.21, at Manatee, Fla.; the monthly precipitation exceeded 10.00 in areas in the south Atlantic and east Gulf states, at Marengo, Ind., and in the Chiri Cahua Mountains, Ariz. Over a greater part of California and at a number of stations in the west part of the plateau region south of the 45th parallel no precipitation was reported, and over the northern and middle plateau regions and on the eastern slope of the Rocky Mountains the rainfall for the month was generally less than 1.00.

The precipitation was in excess of the July average in the south Atlantic and east Gulf states, the lower Rio Grande valley, the east part of the southern plateau region, within an area extending from southeast Wyo. over north Nebr. and south South Dakota, on the immediate north Pacific coast, and at Canadian stations from Manitoba to Quebec; elsewhere it was deficient. The greatest excess occurred on the east Gulf coast, where, at Pensacola, Fla., 11 years record, it was more than 7.00, and on the S. C. coast, where it was more than 5.00 at Charleston. The greatest deficiency occurred from the Ohio Valley westward over Kans., in the north part of the upper Mississippi valley, and in northeast S. Dak., where it exceeded 3.00.

At the following-named places the precipitation for the current month was the heaviest reported for July: Southport, N. C., Statesburgh, S. C., and Pensacola, Fla.; and at the following-named places it was the least on record for July: Grampian Hills and Wellsborough, Pa., Nashville, Tenn., Lexington, Ky., Riley, Ill., Erie, Pa., Cresco, Iowa, Bismarck, N. Dak., La Crosse, Wis., Saint Louis, Mo., Fort Sully and Huron, S. Dak., Wellington, Kans., Fort Custer, Mont., North Platte, Nebr., Concordia and Dodge City, Kans. At Red Bluff, Los